Occurrence of SARS-CoV-2 infection and seroprevalence of IgM and IgG antibodies in police officers: a cross-sectional study

Ocorrência de infecção SARS-CoV-2 e soroprevalência de anticorpos IgM e IgG em policiais militares: um estudo transversal

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Abstract:
Objective: Considering the seriousness of the covid-19 pandemic and the exposure of workers in essential services, this study aimed to assess the SARS-Cov-2 infection rate and the seroprevalence of IgM and IgG antibodies in military police officers in a city in northeastern Brazil. **Methods:** This cross-sectional observational study comprised 139 police officers. They completed a brief socio-epidemiological questionnaire, and biological material was collected to carry out RT-PCR and immunofluorescence tests (IgM and IgG). **Results:** We found that 44.6% had positive RT-PCR, with a seroprevalence of 2.2% and 10.1% for IgM and IgG, respectively. But almost half of those positive were asymptomatic. There was a significant association between the presence of the two antibodies, with OR= 20.7 (p = 0.02). **Conclusion:** These results reinforce the need for testing and immunization in this category, in order to guarantee the safety of the professionals and those that they assist.
Keywords: occupational exposure; epidemiology; police officers; COVID-19.

Resumo:
Objetivo: Considerando a gravidade da pandemia da COVID-19 e a exposição de trabalhadores em serviços essenciais, este estudo teve como objetivo avaliar a taxa de infecção por SARS-Cov-2 e a soroprevalência de anticorpos IgM e IgG em policiais militares de um município do Nordeste Brasil. **Métodos:** Trata-se de um estudo observacional transversal com 139 policiais. Os participantes responderam um breve questionário socioepidemiológico e foram submetidos a testagem por RT-PCR e imunofluorescência (IgM e IgG). **Resultados:** Verificamos que 44,6% apresentaram RT-PCR positivo, com soroprevalência de 2,2% e 10,1% para IgM e IgG, respectivamente. Mas quase metade dos positivos eram assintomáticos. Houve associação significativa entre a presença dos dois anticorpos, com OR = 20,7 (p = 0,02). **Conclusão:** Esses resultados reforçam a necessidade de realização de testagem e imunização nesta categoria, a fim de garantir a segurança dos profissionais e por eles assistidos.
Descritores: exposição ocupacional; epidemiologia; policiais militares; COVID-19.

Introduction

Coronavirus Disease 2019 (COVID-19) is an infectious disease of the respiratory tract caused by the SARS-Cov-2 virus, and, since its discovery in December 2019 in Wuhan, China[1], has become the worst pandemic in the last 100 years. In Brazil, the first case of COVID-19 was registered on February 25, 2020, although studies have shown that the virus circulated in the country a month

earlier[2]. New cases quickly started to appear in all Brazilian regions, and today Brazil is among the three countries with the highest absolute number of infections and deaths[3].

In view of this serious worldwide pandemic, measures such as social distancing and social isolation were introduced in an attempt to contain the spread of the virus, and many people began working from home[4,5]. However, essential service workers, such as health and public security service professionals, needed to maintain their activities, and were more exposed to the virus than workers who could work remotely from home [6,7].

For these reasons, this study sought to assess the SARS-Cov-2 infection rate and the seroprevalence of IgM and IgG antibodies in military police officers from a city in northeastern Brazil.

Methods

A cross-sectional observational study was carried out in June 2020, with 139 military police officers from the city of Aracaju (State of Sergipe), a city in the northeast of Brazil. Sampling was determined by convenience and participants were recruited by researchers during an epidemiological inquiry. This project was approved by the National Bioethics Committee of Brazil (CAAE 31018520.0.0000.5546), volunteers were informed about the characteristics of the project, as well as its risks and benefits, before signing a Free and Informed Consent Form.

The participants completed a brief socio-epidemiological questionnaire, including sex, age, address, the presence of comorbidities and symptoms compatible with COVID-19 and performance of previous RT-PCR. In addition, samples of nasal secretion, using a nasopharyngeal swab, and blood were collected to perform the RT-PCR and immunological tests (IgM and IgG), respectively.

The presence of Anti-SARS-CoV-2 IgM and IgG antibodies was determined in serum by immunofluorescence assays performed at the Department of Pharmacy (Laboratory of Biochemistry

and Clinical Immunology, LaBiC-Imm) of the Federal University of Sergipe (UFS), according to the manufacturer's instructions (Ichroma2™ COVID-19 Ab in conjunction with an Ichroma™ II Reader, Boditech Med Inc., South Korea). SARS-CoV-2 was detected in the samples of nasal secretion by real-time reverse transcription polymerase chain reaction (rRT-PCR) assay, in the Central Laboratory of Molecular Biology of the State of Sergipe, as previously described[7,8].

The tabulation of collected data was performed in Excel spreadsheets, and a descriptive statistical analysis was performed, with determination of mean, standard deviation and percentage. The association between the seroprevalence of IgM and IgG antibodies was verified by Fisher's exact test using the software GraphPad Prism® 6.0 (GraphPad Software, Inc., CA. USA), and the odds ratio (OR) and its confidence interval of 95% (95% CI) were estimated. The level of statistical significance used was $p < 0.05$.

Results

As can be seen in Table 1, the sample comprised 139 police officers, most of whom were male (n=129; 92.8%), aged over 40 years (n=81; 58.3%), residing in the city in which the study was conducted (n=115; 82.7%). Most participants self-declared having no comorbidities (n=110; 79.1%), or COVID-19 symptoms (n=77; 55.4%). Only one of the eight police officers who had already taken a PCR test reported being tested positive.

Of the entire sample, 62 police officers (44.6%) had a positive RT-PCR result for COVID-19. In addition, the seroprevalence of IgM and IgG was 2.2% (n=3) and 10.1% (n=14), respectively. Both antibodies were present in only two police officers. Among the individuals with a positive RT-PCR test, the occurrence of classic symptoms, such as flu, predominated, but almost half of those positive were asymptomatic. We verified a significant association between IgM and IgG seropositivity, $p = 0.0268^*$ (OR = 20.7; 95% CI = 1.7 – 245.1).

Table 1: Demographic and health profile of the military police participating in the study.

Sociodemographic variables	Total		RT-PCR positive		SARS-CoV-2 IgM seropositivity		SARS-CoV-2 IgG seropositivity	
	n	%	n	%	n	%	n	%
Military police	139	100	62	44.6	3	2.2	14	10.1
Age group (41 ± 7.8 years old)								
≤ 40 year old	58	41.7	28	48.3	1	1.7	8	13.8
> 40 year old	81	58.3	34	42.0	2	2.5	6	7.4
Gender								
Male	129	92.8	57	44.2	3	2.3	14	10.9
Female	10	7.2	5.0	50	0	0	0	0
Locality								
Capital	114	82.0	53	46.1	1	0.9	10	8.7
Other municipalities	25	18.0	9.0	36	2	8.0	4	16
Comorbidities								
No	110	79.1	51	46.4	2	1.8	14	12.7
Yes	29	20.9	11	37.9	1	3.4	0	0
COVID Symptoms								
No	77	55.4	14	18.2	2	2.6	10	13.0
Yes	62	44.6	18	12.9	1	1.6	4	6.5

Discussion

In this study, it was possible to verify the incidence of COVID-19, as well as the seroprevalence of IgM and IgG antibodies in military police officers. The sample of 139 police officers, out of a total of 4,738 police officers registered in the state of Sergipe, showed a predominance of male adults. This characteristic is common to the category and is related to the nature of the work[9].

There was a high rate of police officers who were PCR positive for SARS-CoV-2, especially among those who lived in the state capital where the study was carried out. This fact is related to the distribution of the disease initially in the capital with a later spread to the rest of the state[8,10].

In addition, the characteristics of police work contribute to the spread of the virus among professionals, as they share common spaces such as refectories, dormitories and automobiles, in addition to having a high daily workload, ranging from 12 to 24 hours. Thus, although efforts to implement preventive measures to reduce the spread of the disease were made, such as social

distancing, frequent hand washing and the use of a mask, working conditions, particularly the necessity of frequent close contact between the officers, or the officers and the public, reduced the potential effectiveness of these measures.

For these reasons, periodic testing to screen and detect workers with the disease is extremely important to contain its spread. In this regard, the use of RT-PCR has been considered the gold standard for the diagnosis and monitoring of the occurrence of COVID-19, even though it presents variations in specificity and sensitivity [11]. Even so, the early detection of cases of workers positive for COVID contributes to reducing the spread of the virus, since it is possible to isolate the professional for proper treatment, with release according to the protocols established by the WHO[12].

In our study, almost half of the participants tested positive for SARS-CoV-2, the majority being asymptomatic. These findings are important as the absence of characteristic symptoms of the disease in many cases makes early detection difficult, increasing the risk of transmission[13]. For this reason, the performance of screening tests in asymptomatic individuals corresponds to an interesting strategy to contain the spread of the disease in work environments, especially when spaces are shared by several people, in order to ensure the safety of workers and society as a whole[14].

Furthermore, the investigation of the seroprevalence of IgM and IgG antibodies against SARS-CoV-2 is an interesting complementary resource[8,15], in order to verify the degree of exposure and the development of immunity in the population, and the identification of asymptomatic infections [16]. In addition, we found a significant association between IgM and IgG, with individuals who were positive for IgM having a 20 times greater chance of being positive for IgG as well. In these cases, it is possible to suggest the occurrence of reinfection[17] or overlapping of the production curves of the immunoglobulins in question[16].

These findings reinforce the need for testing and immunization of workers in essential services, in order to enable the maintenance of activities in a safe way for workers and for society. In

addition, it is worth noting that compliance with preventive measures is also necessary, and should be carefully monitored.

Conclusion

Through this study, it was possible to verify that essential service workers, such as police officers, are routinely exposed to the risk of contamination with the new corona virus. In addition, job characteristics can further increase the risk of infection. For this reason, it is necessary to carry out frequent testing and immunization for this category, in order to enable the maintenance of activities in a safe way for professionals and for society.

Conflicts of Interest: The authors declare no conflict of interest.

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